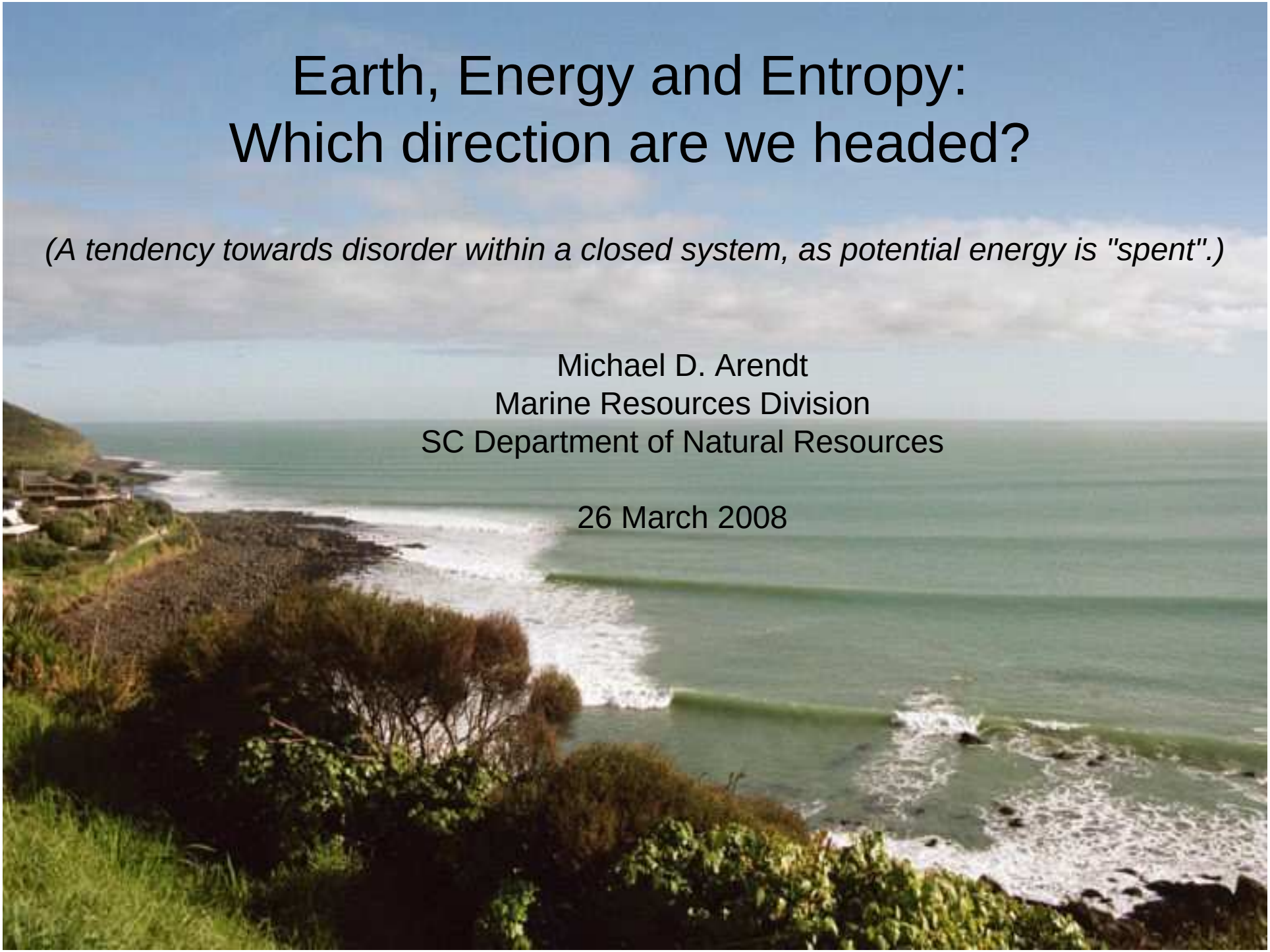


Earth, Energy and Entropy: Which direction are we headed?

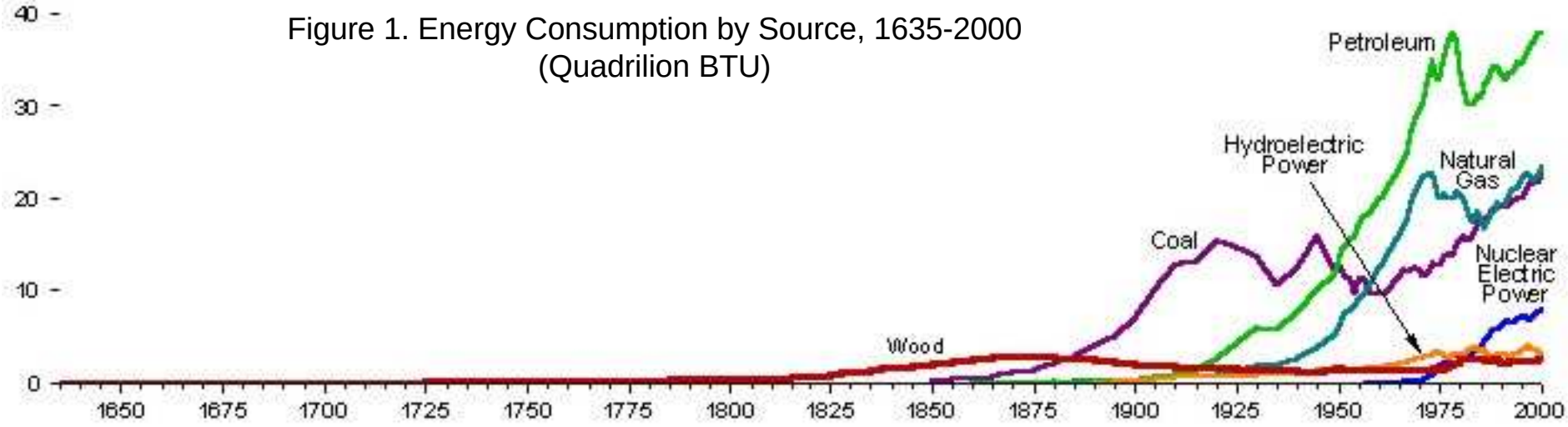
(A tendency towards disorder within a closed system, as potential energy is "spent".)

Michael D. Arendt
Marine Resources Division
SC Department of Natural Resources

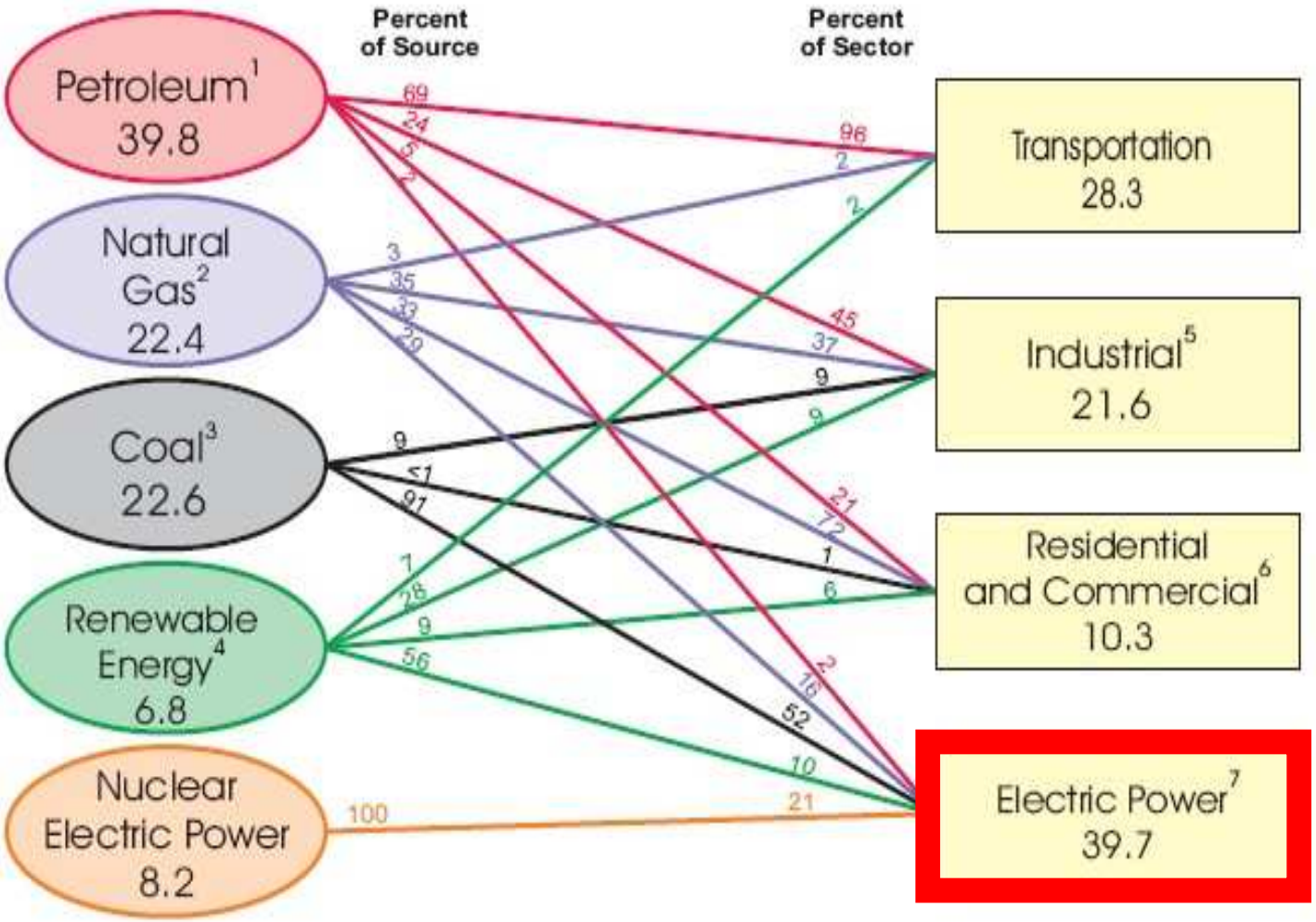
26 March 2008

Temporal Change in Energy Consumption Patterns

Figure 1. Energy Consumption by Source, 1635-2000
(Quadrilion BTU)



http://www.eia.doe.gov/emeu/aer/eh/frame.html



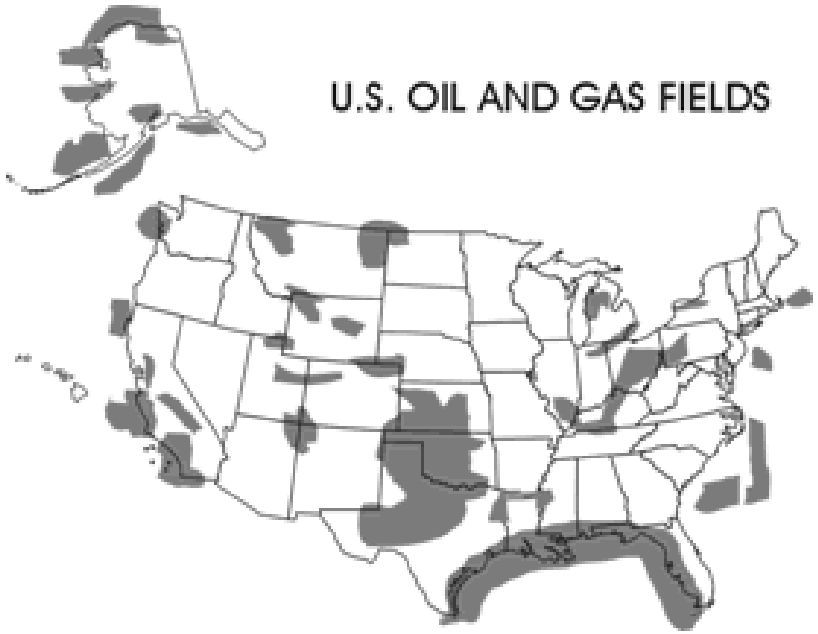
Source: Energy Information Administration, Annual Energy Review 2006, Tables 1.3 and 2.1b-2.1f, and 10.3.

[1] -http://www.eia.doe.gov/kids/infocardnew.html#TOTAL%20ENERGY%20and%20EFFICIENCY%20OF%20USE

Locally Distributed & Finite Resources

U.S. Coal Supply (World's Largest)

http://www.eia.doe.gov/kids/energyfacts/sources/non-renewable/coal.html#Environment



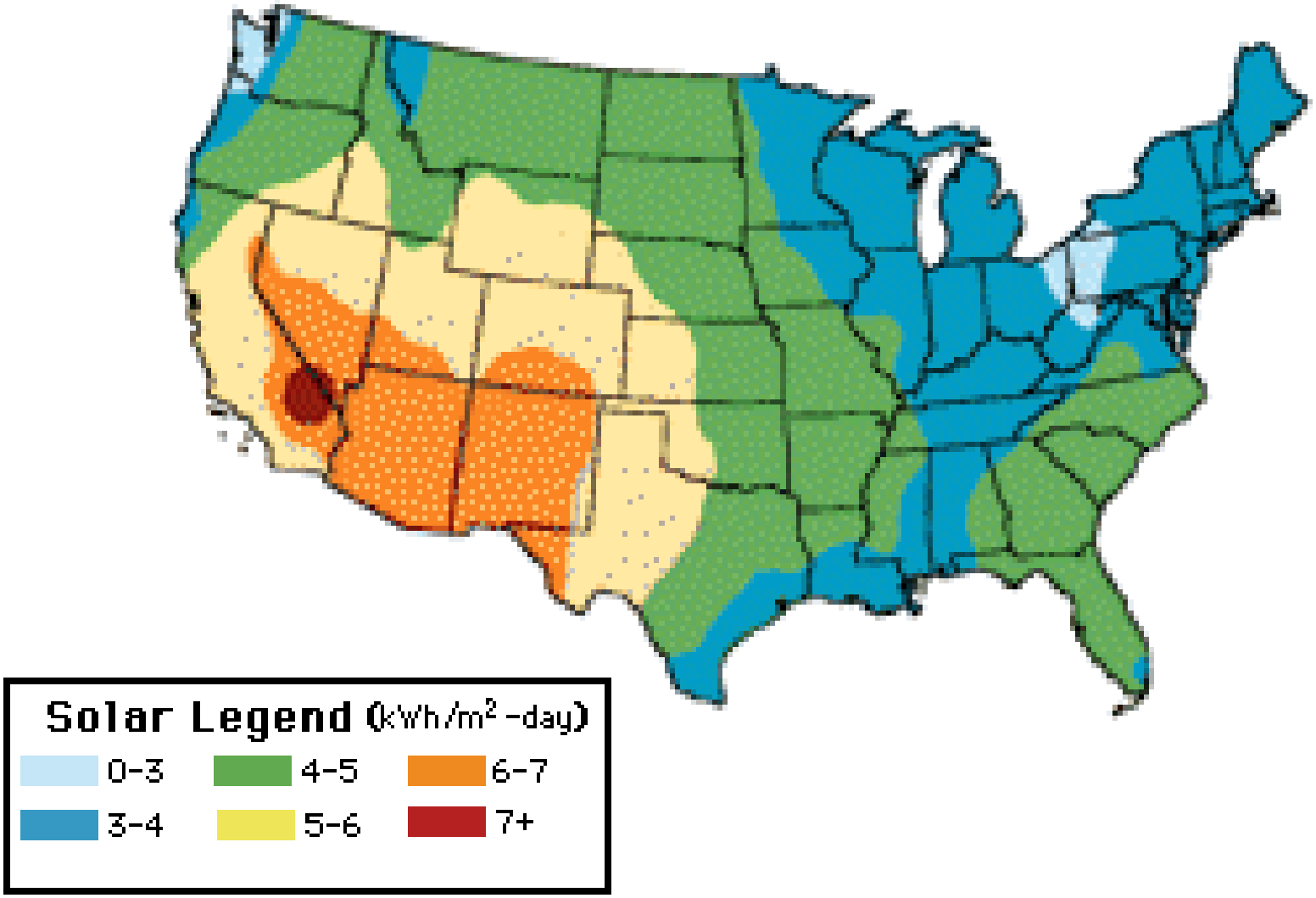
http://www.eia.doe.gov/kids/energyfacts/sources/non-renewable/offshore.html

- Coal transport cost can exceed harvest cost (subsidized)
- Coal 200 to 250 year supply; declining Appalachian production (Reuters 2007)
- 300,000 miles of Natural Gas Pipelines in U.S.
- U.S. consumed 23% of global natural gas in 2004; import > export by 2015

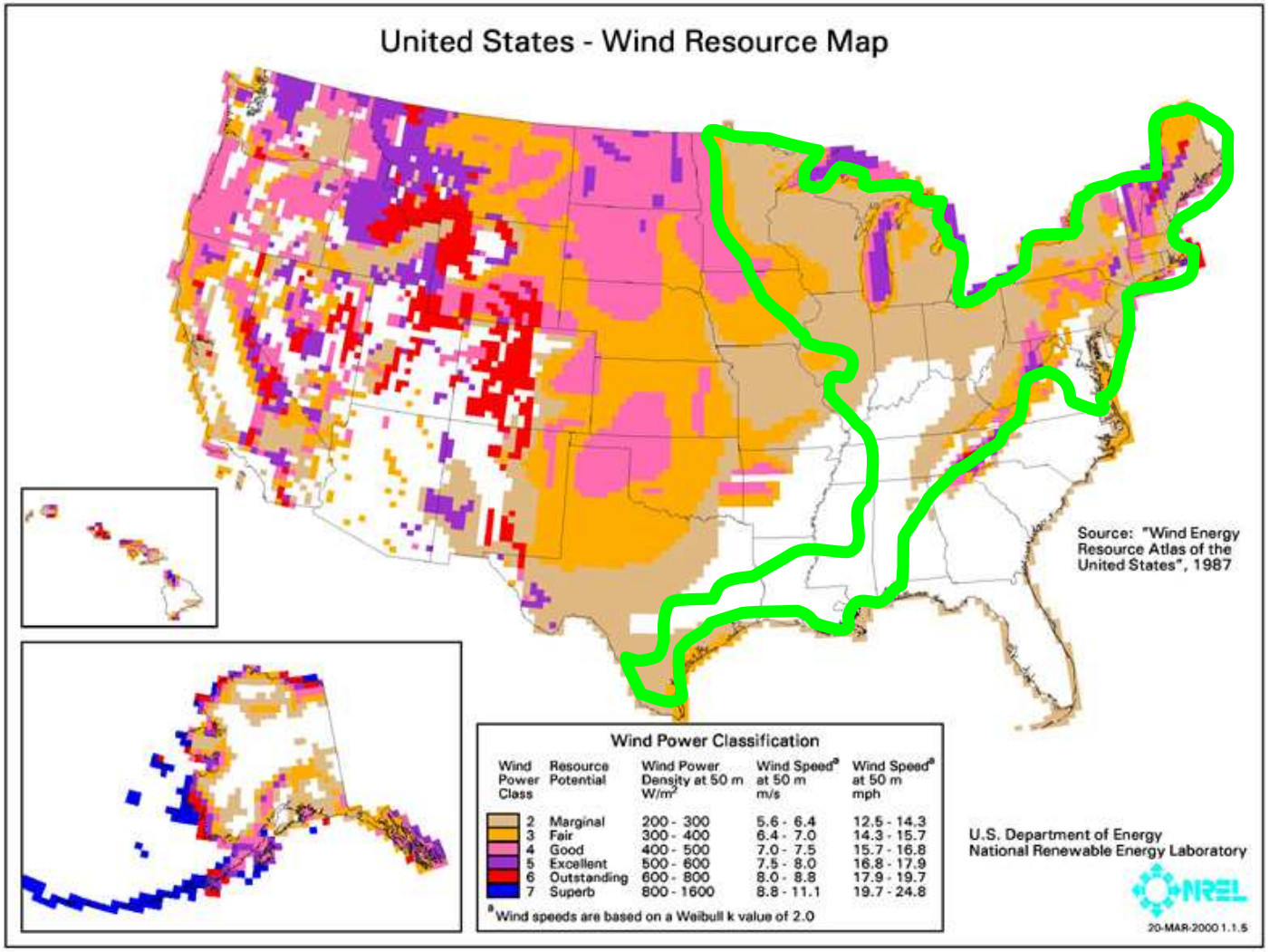
“The best-laid plans of mice and men oft go awry” – Robert Burns, 1785

http://observe.arc.nasa.gov/nasa/space/prospector/lunar5.htm


A Refreshing Future?

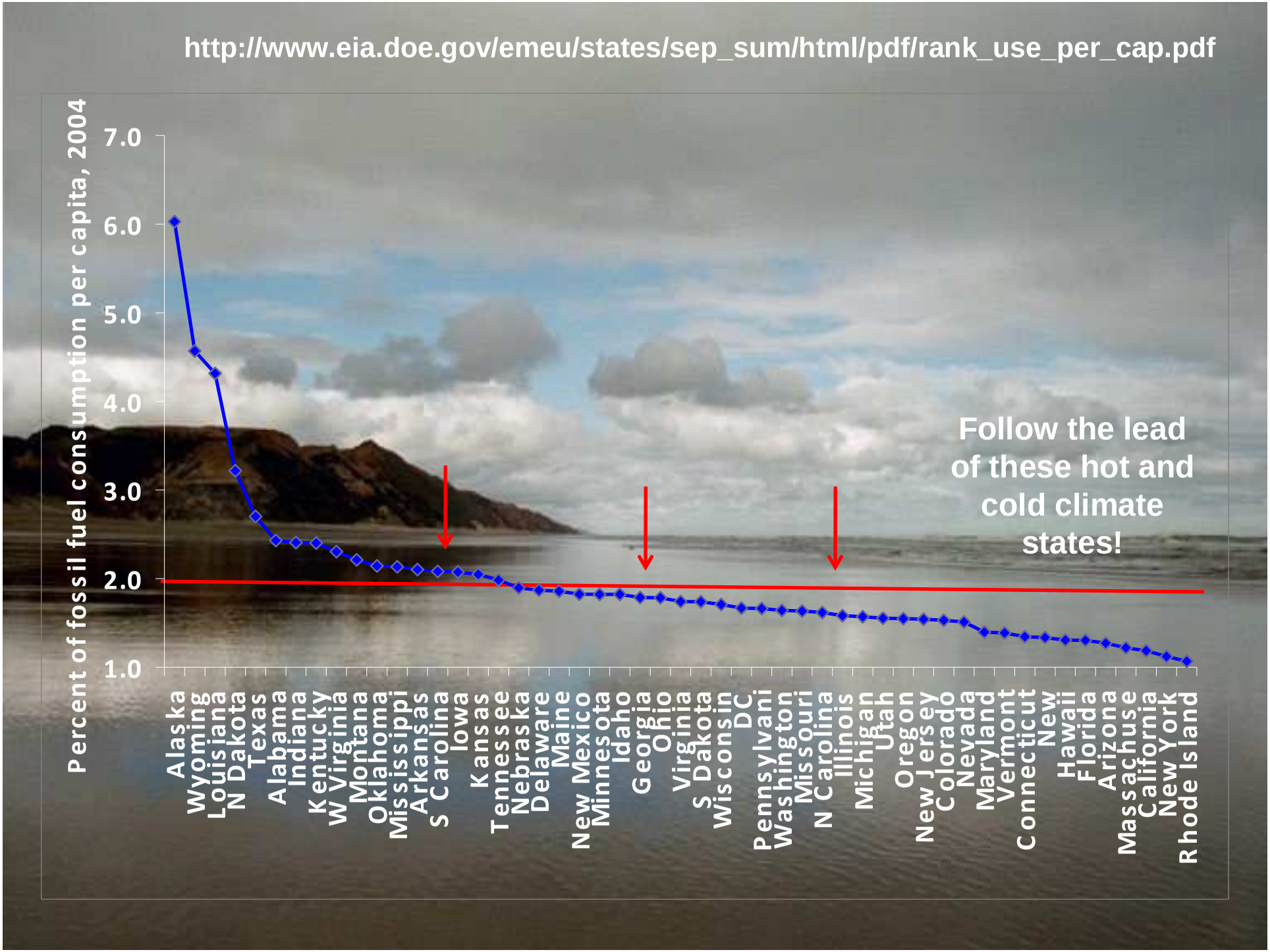


http://www.ecomall.com/biz/solarcat.htm

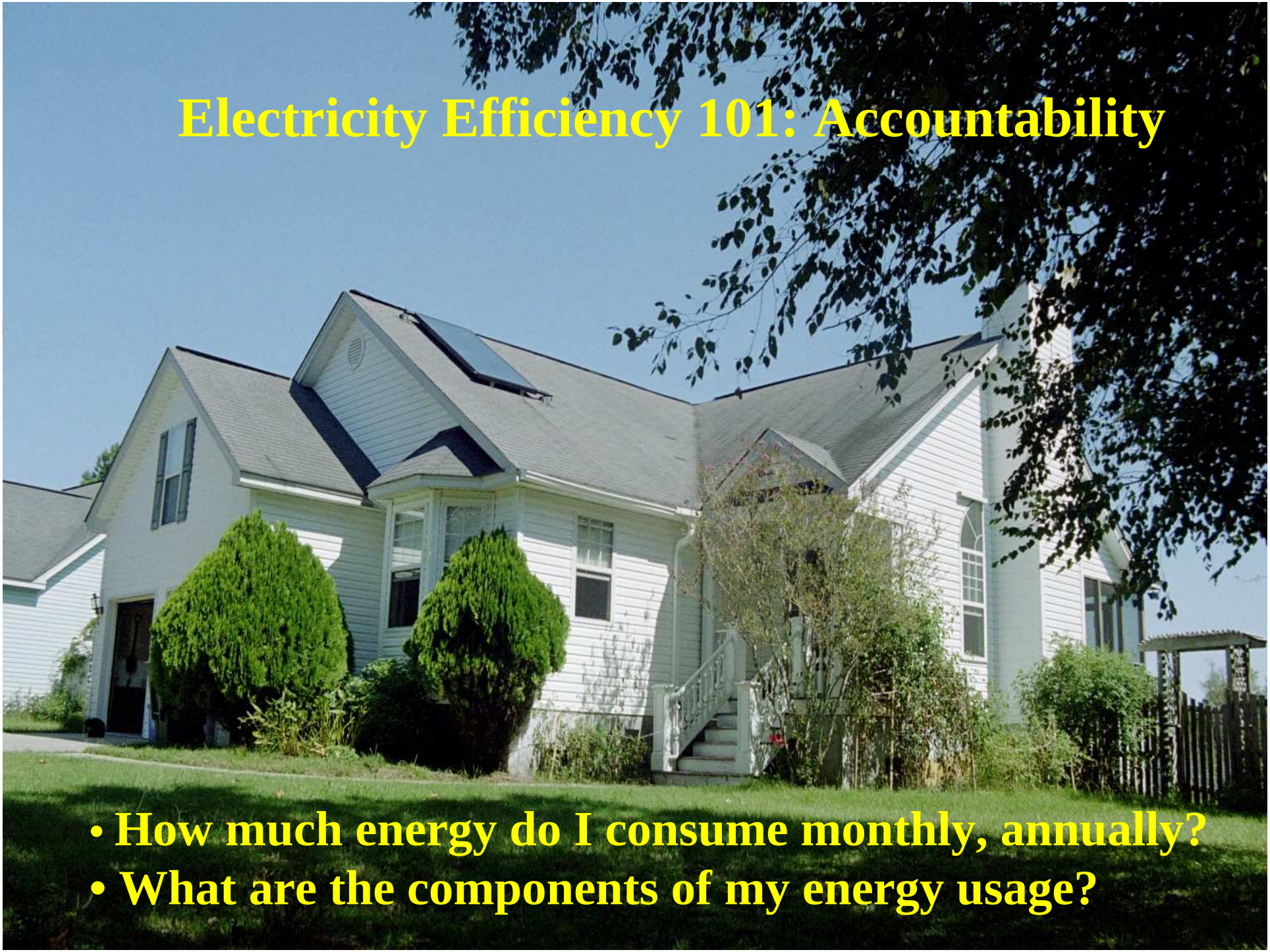


http://www.arkansasrenewableenergy.org/wind/wind.html#us_map

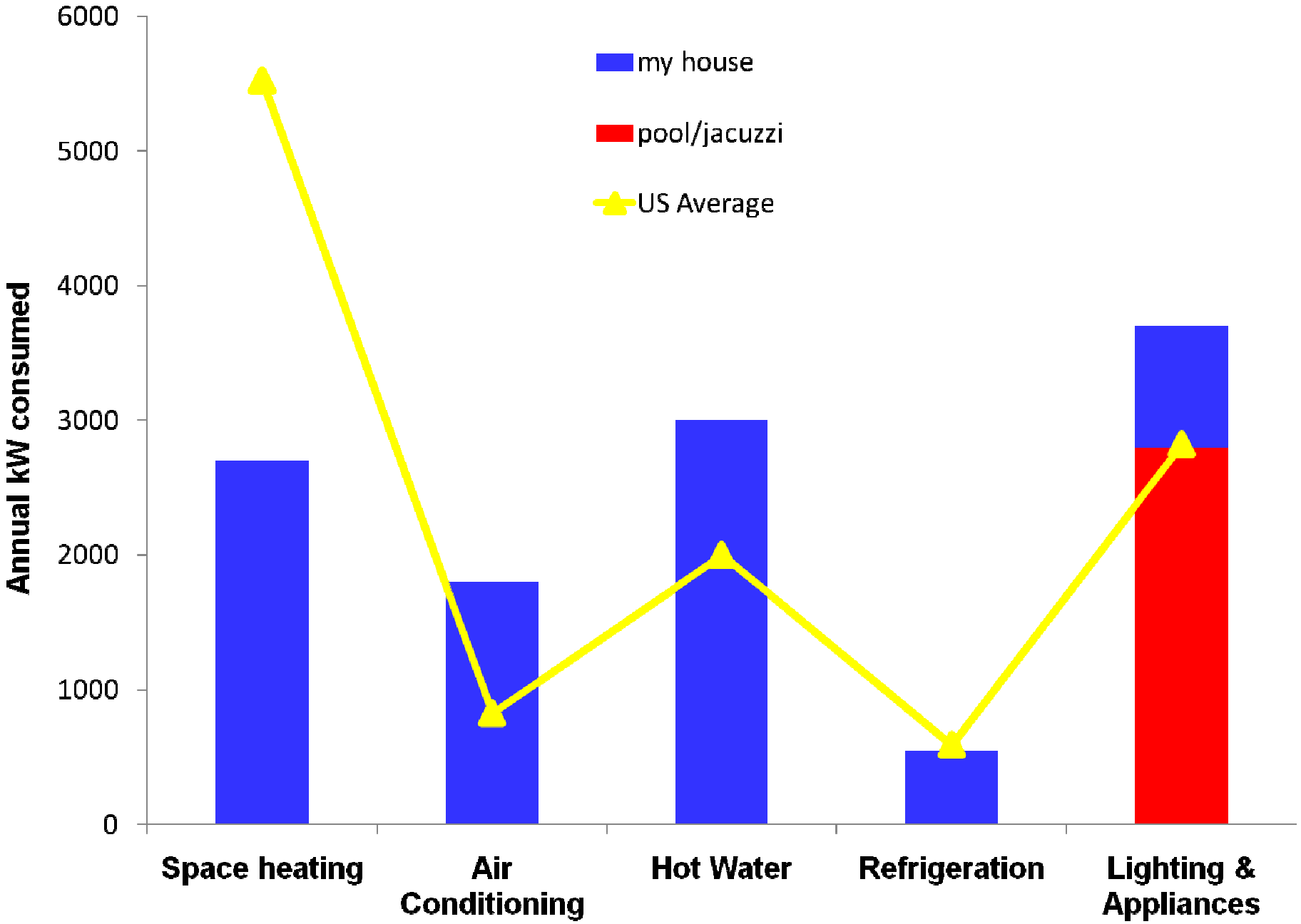
http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/rank_use_per_cap.pdf



Electricity Efficiency 101: Accountability

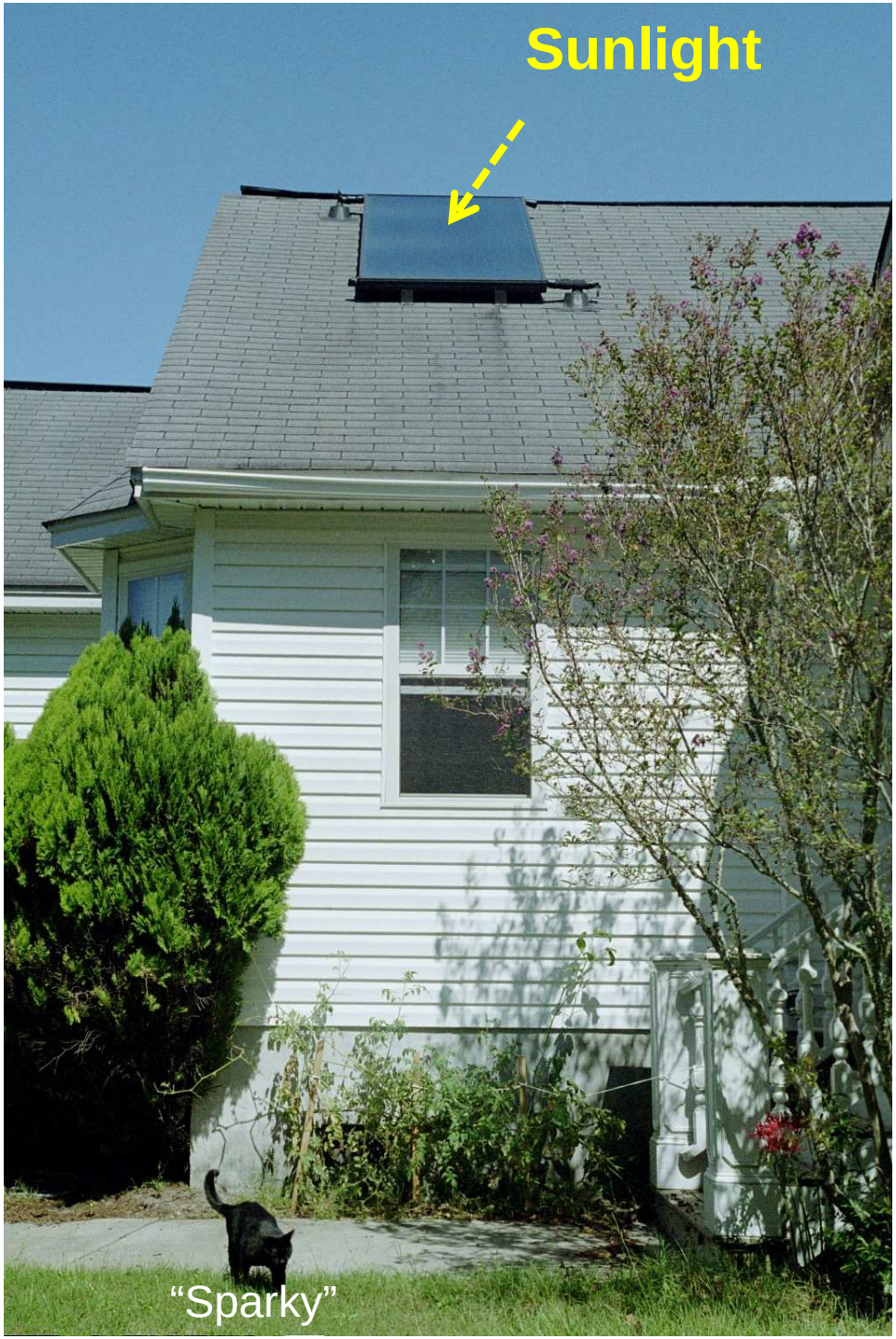


- How much energy do I consume monthly, annually?
- What are the components of my energy usage?


6000
5000
4000
3000
2000
1000
0
Annual kW consumed
my house
pool/jacuzzi
US Average
Space heating
Air Conditioning
Hot Water
Refrigeration
Lighting & Appliances

Simple Savings: “No Cost, Low Cost”

	Before (kW)	After (kW)	% change	$$/yr
Lighting	74.7	7.8	90	$74.22
Power Strip	25.9	0	100	$28.73
Don't use	30.24	0	100	$33.55
Re-set Thermostat (<68F; >78F)	4400	3750	15	$60.09
Total Savings				$196.59


Sunlight
"Sparky"


127F @ noon;
138F by 4pm
"Sparky"
Energy-efficient pump moves warm fluid from roof to tank


Will there be another race to
Come along and take over for us
Maybe Martians will do
Better than we've done
We'll make great pets!
My friend says we're like
The dinosaurs
Only we are
Doing ourselves in
Much faster than they…ever did!
- Perry Farrell, "Pets"

Electricity Generation Capacity, 2005

http://www.eia.doe.gov/cneaf/electricity/epa/epat2p2.html

Energy source	N generators	Capacity (MW)	MW/generator	% Generation
Coal[1]	1,522	335,892	221	31.5
Petroleum[2]	3,753	64,845	17	6.1
Natural Gas [3]	5,467	436,991	80	41.0
Other Gas [4]	102	2,293	22	0.2
Nuclear	104	105,585	1,015	9.9
Hydroelectric [5]	3,993	77,354	19	7.2
Renewables [6]	1,671	23,553	14	2.2
Pumped Storage	150	19,569	130	1.8
Other[7]	45	928	21	0.1
Total	16,807	1,067,010	63	